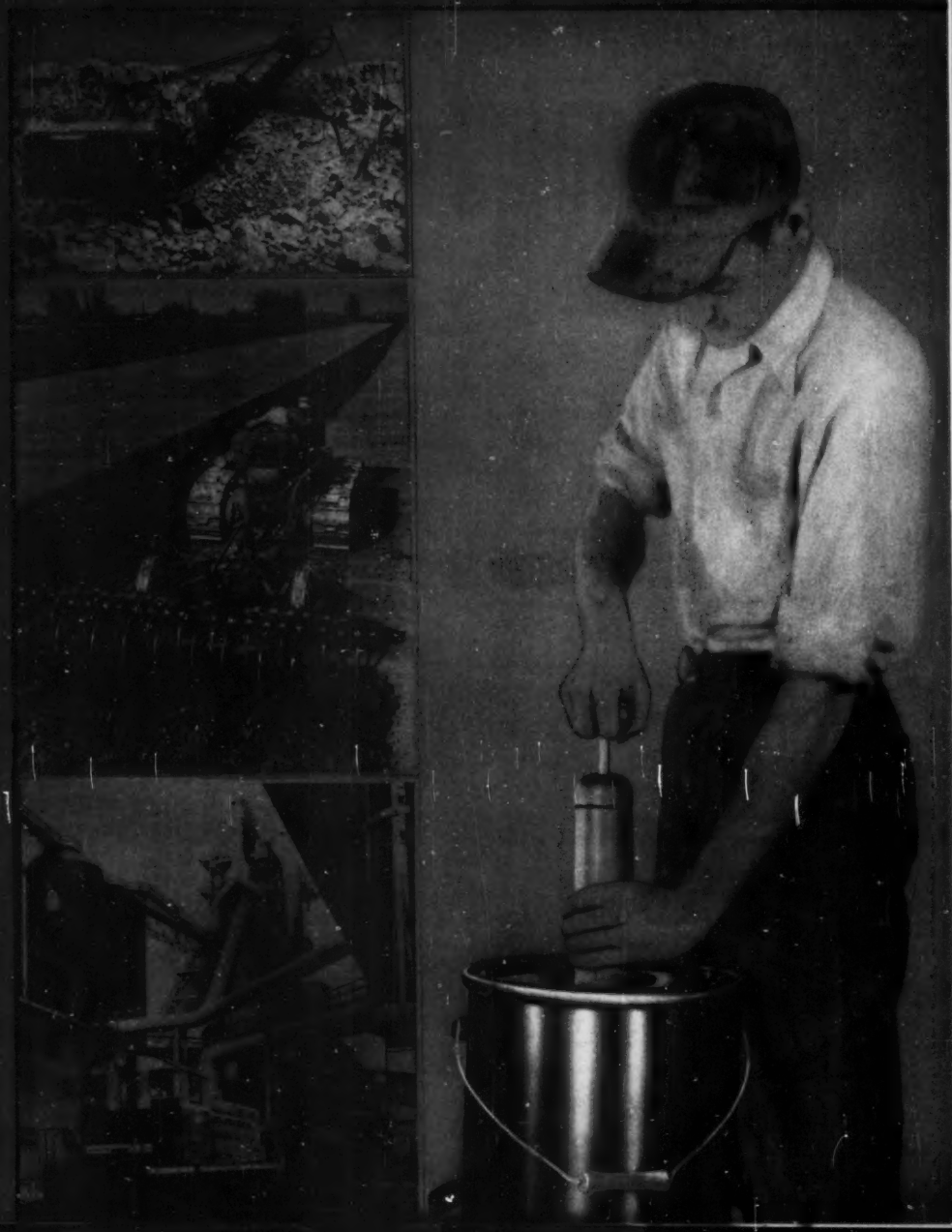
The Spokesman

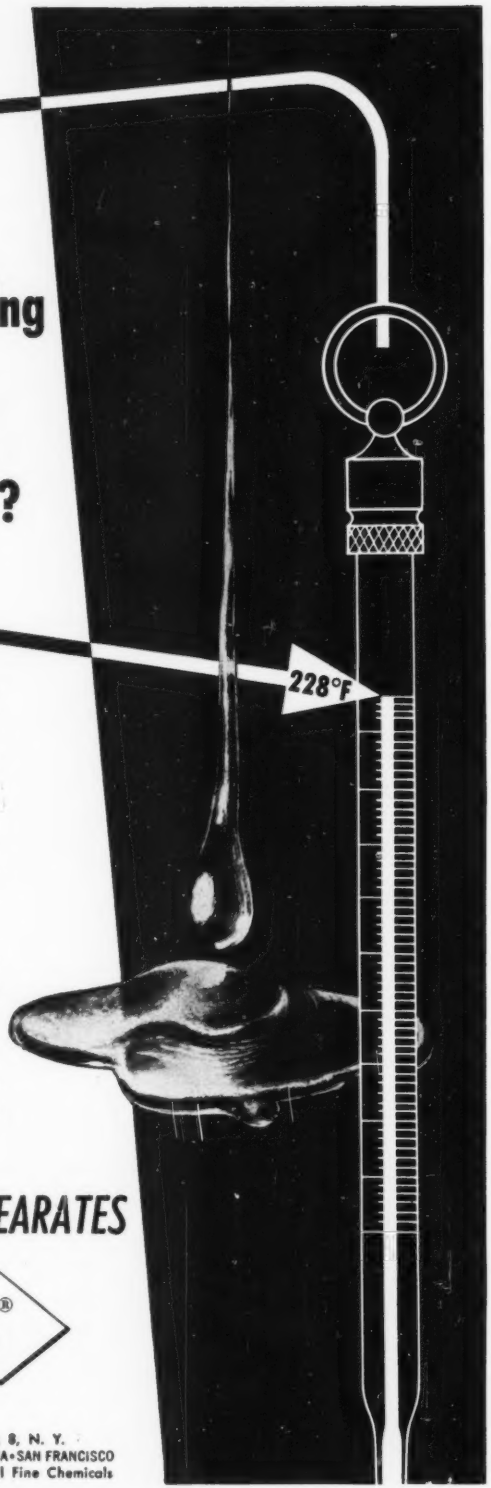
JANUARY • 1953



OFFICIAL PUBLICATION

NATIONAL LUBRICATING GREASE INST NLGI

are your grease-making costs DROPPING?



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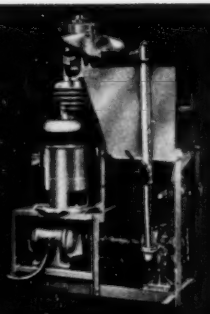

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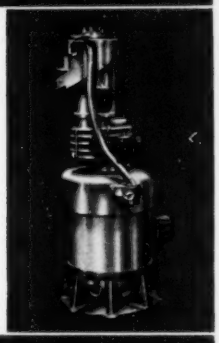

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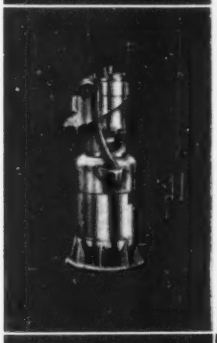

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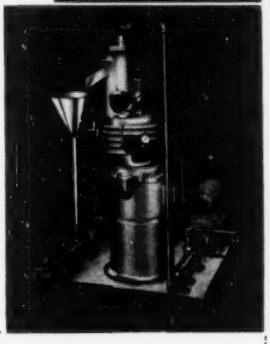

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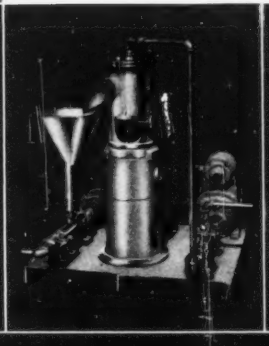

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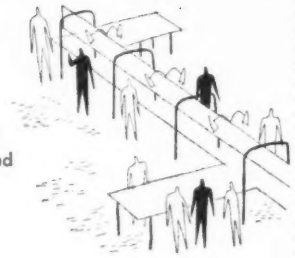

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ABOUT THE COVER

The Inland "Kleen-Fil" Grease Gun Filler Pail, manufactured by Inland Steel Container Company, is said by the manufacturer to have received a wide acceptability among industrial plants, farmers, and contractors on the basis it provides an easy, efficient, and clean method of filling grease guns. Lubricating manufacturers are said to find this a distinct selling advantage for their products.

It is stated that the simplicity of design of the Inland "Kleen-Fil" Pail makes it foolproof and trouble-free in operation. The grease gun is simply inserted through the "U-Press-It" opening in the cover of the pail. A tight fit is established in the follower plate, and a slight downward pressure on the gun releases the plate from the cover, and as the plate is forced downward, the gun handle is withdrawn. The grease is quickly and uniformly forced into the grease gun barrel. Uniformity of pressure is assured and the grease packs into the gun solidly. Air pockets are eliminated, and the annoying clean-up and waste common to packing grease guns by hand is avoided.

A heavy sponge rubber gasket, which is impervious to grease, sweeps the sides of the pail clean as the follower plate is depressed. This gasket adapts itself to any dents in the container wall. Protection from dirt and contamination is assured, since neither the follower plate nor the cover is removed from the pail until it is empty.

Inland Steel Container Company, 6532 South Menard Avenue, Chicago 38, Illinois, manufacturer of the "Kleen-Fil" Pail, also manufactures plain grease pails in 25-pound and 50-pound sizes, as well as 100-pound and 400-pound grease drums, with a choice of several types of covers to meet varying requirements. The Inland "Por-Pail" line of small containers, and a full line of drums, are available in a wide variety of sizes and types.

President's page

by George E. Merkle, President, N.L.G.I.

LOOKING AHEAD

As we approach the "New Year" most of us look back on the past year's accomplishments to see how successful our efforts have been and try to find the points on which improvements can be made. We also try to predict what is in store for us in the year ahead.

For some years past we have started the year with many uncertainties but it is doubtful if any of the past years has been as uncertain as 1952 appears to be. With the confused status of the Korean situation, the many instances of corruption being exposed, heavy tax burdens, and the inequities in price and wage freezes, much uneasiness has resulted.

Such conditions present real problems to all industry and serve as serious deterrents to maximum and efficient production. Most business men will agree, I believe, that more and better production will greatly assist in lowering the cost of living and reducing inflation.

The lubricating grease industry, like all other industries, is suffering from these causes. Such added problems, added to the increased demands on our industry in these times makes the load unreasonably heavy for management.

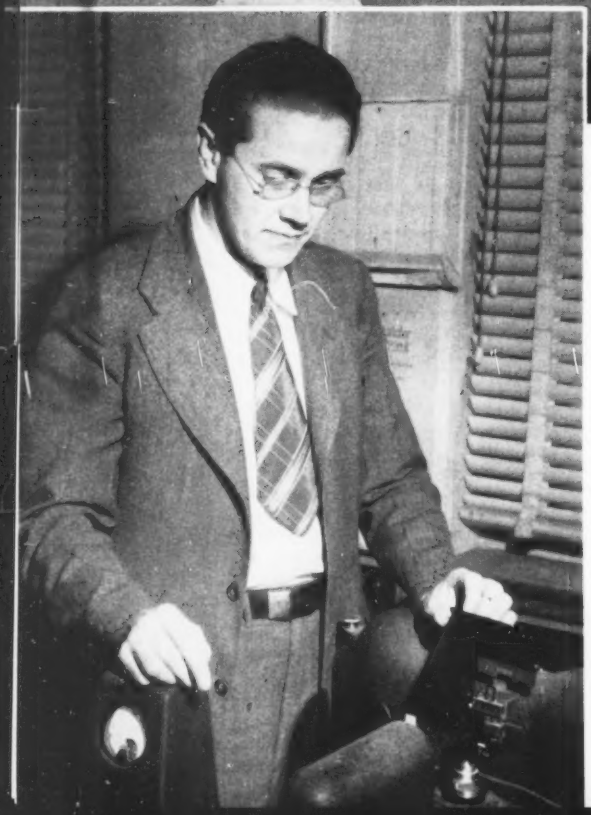
It is most fortunate that the "Lubricating Grease and Petroleum Industry" is composed, today, of a large number of highly trained technical men so necessary to cope with the problems of our industry. Though many more are needed, those now available, if not hampered, can do the job before us, in my estimation.

Our products are so vital to all branches of the military and industry that top priority for all essential needs such as materials and manpower should be granted our industry.

In spite of the present overload we will very probably strain our resources to the limit and meet all Governmental and civilian requirements.

Science Hall at the University of Southern California is the building where experiments described here were carried on.

Editor's Note: Last year the National Lubricating Grease Institute established a Fellowship at the University of Southern California. This article and pictures illustrate research being carried on under the N L G I Fellowship.



Dr. Vold uses the x-ray spectrometer to determine the crystalline nature of the soaps studied. He heads NLGI Fellowship.

Rheological Studies

and Electron Microscopy of Calcium Stearate - Cetane Gels

R. D. VOLD, H. F. COFFER, R. F. BAKER
Department of Chemistry and
Electron Microscopy Laboratory
University of Southern California

This paper contains data showing the yield value of gels of calcium stearate monohydrate in cetane as a function of time of mechanical working starting with both quenched and slow-cooled systems, and the effect of water content and aging on the yield value. Electron micrographs of the samples show the structural changes occurring as a result of working, hydration, and time. The samples for electron microscopy were prepared by slicing frozen blocks of the gel into sections 0.05 — 0.1 μ (0.000003 inches) thick (5). Comparison was also made with samples prepared by smearing the gel between glass slides, and removing the cetane by various alternative procedures.

Although chemically pure hydrous calcium stearate in cetane does not readily form a practical grease, its rheological behavior is not different in type from that commonly displayed by commercial calcium base greases. Electron micro-

Upper: Electron Micrographs of Hydrous Calcium Stearate-Cetane Smears

Left: Smear, Benzene extracted and air dried. 25% calcium stearate monohydrate, 75% cetane.

Center: Smear, Benzene extracted and Frozen Dried. 25% calcium stearate monohydrate, 75% cetane.

Right: Calcium Stearate Monohydrate dispersed in excess Cetane.

Right—Dr. Baker and Dr. Coffer prepare ultrathin sections with the modified microtome used to slice sections of grease they will study.

Actual slicing of a thin section of grease is shown here. Note the frozen block of grease in the jaws of the microtome and the binocular microscope for observing the thin sections as they float off the knife onto the water in the trough.

Thin sections of grease are floating on water. These are so thin that when dried on an electron microscope screen they are barely visible to the naked eye.

graphs of samples prepared by the same procedure as has been used by others (1, 4) in studying commercial greases indicate, however, that calcium stearate does not have so fibrous a habit as calcium tallow soaps. These circumstances make the results, which are completely definitive for the particular system studied, only suggestive for calcium base greases generally.

The principal problem on which these experiments bear is that of determining the nature of the soap structure which gives a grease its rheological properties. Previous work has established that the soap is present as disordered crystallites (6). Likewise it seems to be established that the consistency increases with increasing length and increasing

length/width ratio of fibrous crystallites in systems such as sodium soap greases where the soap is known to have a fibrous habit (2). What has not yet been adequately studied is the secondary structure built up from the primary particles. A number of experimental techniques may be brought to bear on this problem of which the present electron microscopy of thin slices is a potentially powerful example.

EXPERIMENTAL RESULTS

Fig. 1 AB shows electron micrographs of gelled samples of 25 per cent calcium stearate monohydrate in cetane prepared by smearing the material between glass slides, extracting the cetane with benzene, and removing the solvent by evaporation at room temperature and at —180°, respectively. Fig. 1 C shows the characteristic appearance of a free-flowing dispersion of calcium stearate in cetane treated similarly. In all three cases the soap residue consists of discrete agglomerates of irregularly shaped particles. In the gel, as would be expected, the primary particles are much more consolidated into porous aggregates than in the dispersion. Genuine fibers do not seem to occur in this system.

Figs. 2 AC and 2 BD show the effect on the structure of the soap residue of extracting the cetane with benzene as compared with direct evaporation in vacuum. Either the extraction disperses the soap particles or the direct evaporation agglomerates them, the former being mechanistically the more likely occurrence.

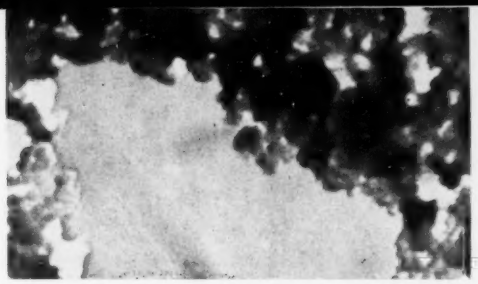
Figs. 3 AB and 3 CD show that the particles formed in quenched samples are much smaller than those formed when the same system is cooled slowly (two or three hours), and also show again the dispersing effect of benzene extraction of the smears. The quenched samples are white, unctuous, rather hard greases while the slow-cooled ones are soft, granular, translucent and highly syneretic gels.

Fig. 4 A, contrasted with 4 BC, shows the tremendous difference in structure of the soap residue in a slice as contrasted with a smear of the same system while Figs. 5 AB show that the continuous soap structure in a slice is disintegrated on benzene extraction.

This group of electron micrographs shows that the slicing technique is necessary in a study of the way in which the primary soap particles are organized to form the secondary structure presumably present in the grease. They also suggest that the smearing process actually increases the apparent size of the ultimate particles, perhaps by some sort of rolling up mechanism, so that the slicing procedure is preferable for particle size studies also. Further, *solvent* extraction to remove the oil must be avoided in studying the manner in which the primary soap particles are aggregated.

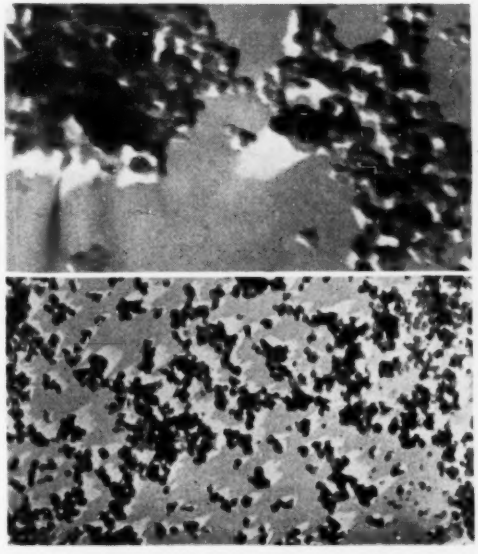
That the manner of particle aggregation is important rheologically is suggested by Fig. 6 AB which shows that in a quenched system (grease-like) as compared with a slow-cooled system (unstable) not only are the ultimate particles smaller but also they appear to be aggregated in a manner somewhat analogous to dendritic crystals.

Mechanical working of a quenched gel of 45 per cent calcium stearate monohydrate in cetane lowers its yield value, at first rapidly and then more and more slowly, with a limiting yield value being reached after about three hours in the reciprocating perforated piston type agitator used (12 strokes per minute). Typical data are shown in Fig. 7. Fig. 8 shows electron micrographs of similarly prepared samples after vari-



A. Smear of 45% Calcium Stearate Monohydrate, 55% Cetane Gel quenched from 155° C. Cetane removed by Evacuation. Chromium Shadowed.

B. Smear of 45% Calcium Stearate Monohydrate, 55% Cetane Gel quenched from 155° C. Cetane removed by Evacuation. Chromium Shadowed.



C. Smear of 45% Calcium Stearate Monohydrate, 55% Cetane Gel quenched from 155° C. Cetane removed by Benzene Extraction followed by air drying. Chromium Shadowed.

D. Smear of 45% Calcium Stearate Monohydrate, 55% Cetane Gel quenched from 155° C. Cetane removed by Benzene Extraction followed by air drying. Chromium shadowed.

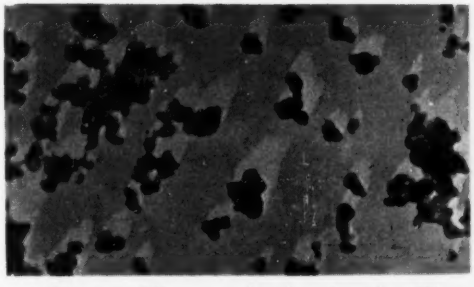
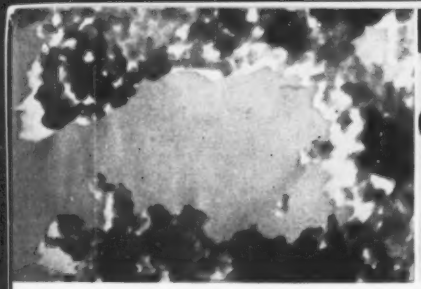
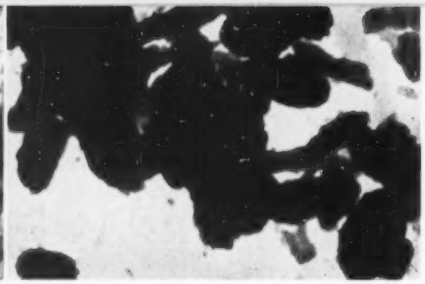


Fig. 2. Electron Micrographs showing the Effect of Solvent Extraction



A.



B.

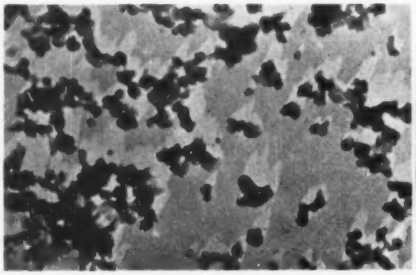
Fig. 3. Electron Micrographs showing the Effect of Rate of Cooling on Size of Primary Particles

A. Smear of 45% Calcium Stearate Monohydrate, 55% Cetane System quenched from 155° C. Cetane removed by Evacuation. Chromium Shadowed.

B. Smear of 45% Calcium Stearate Monohydrate, 55% Cetane System Slow-cooled from 155° C. Cetane removed by Evacuation. Chromium Shadowed.

C. Smear of 45% Calcium Stearate Monohydrate, 55% Cetane System quenched from 155° C. Cetane removed by Benzene Extraction. Chromium Shadowed.

D. Smear of 45% Calcium Stearate Monohydrate, 55% Cetane System Slow-cooled from 155° C. Cetane removed by Benzene Extraction. Chromium Shadowed.



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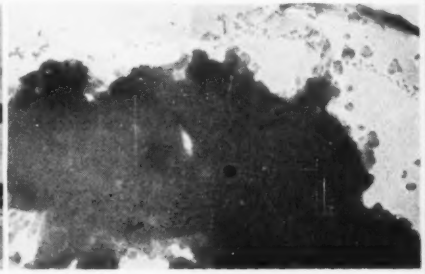
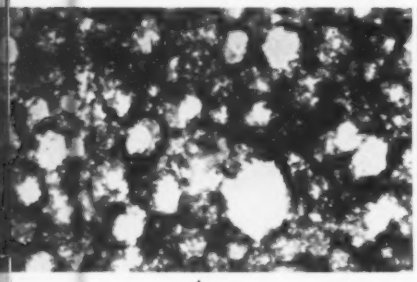
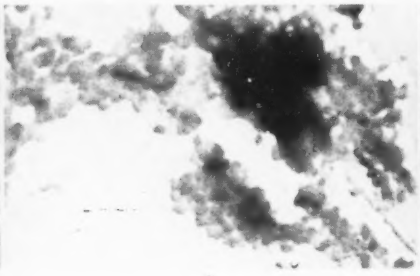


D.

↓ **Fig. 4. Electron Micrographs contrasting Sectioning with Smear Techniques**



A.



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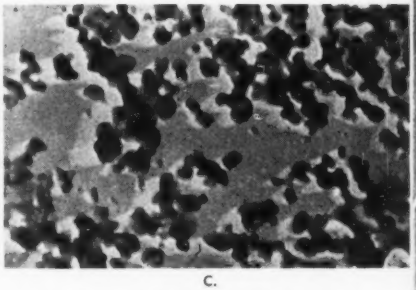
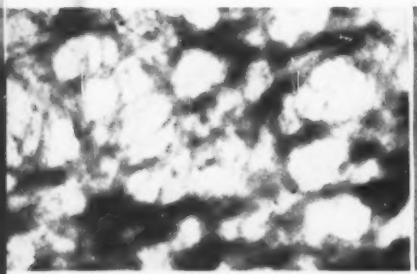


C.

A. Section of 45% Calcium Stearate 55% Cetane Gel. Contains 1.17% Water on Soap Basis. Cetane removed by Evacuation.

B. Smear of 45% Calcium Stearate 55% Cetane Gel. Contains 1.17% Water on Soap Basis. Cetane removed by Evacuation. Chromium Shadowed.

C. Smear of 45% Calcium Stearate 55% Cetane Gel. Contains 1.17% Water on Soap Basis. Cetane removed by Benzene Extraction. Chromium Shadowed.



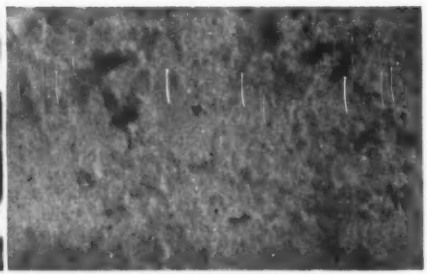
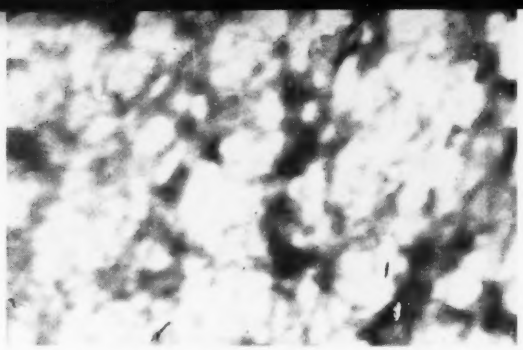


Fig. 5. Electron Micrographs showing Effect of Solvent Extraction on Thin Sections

A. Section of 25% Calcium Stearate Monohydrate, 75% Cetane Gel quenched from 155° C. Cetane removed by Evacuation.

B. Section of 25% Calcium Stearate Monohydrate, 75% Cetane Gel quenched from 155° C. Cetane removed by Benzene Extraction followed by Freeze-drying. Chromium Shadowed.



A. Section of 45% Calcium Stearate Monohydrate, 55% Cetane system quenched from 155° C. Cetane removed by Evacuation.

B. Section of 45% Calcium Stearate Monohydrate, 55% Cetane system Slow-cooled from 155° C. Cetane removed by Evacuation.

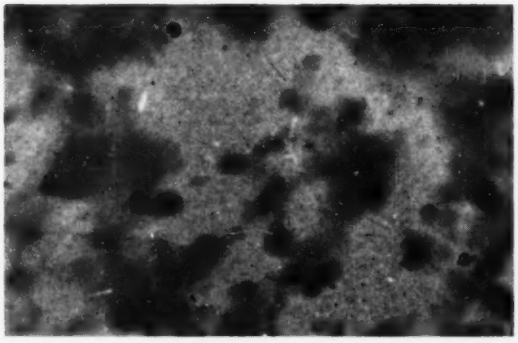


Fig. 6. Electron Micrographs showing the Effect of Rate of Cooling on Secondary Structure

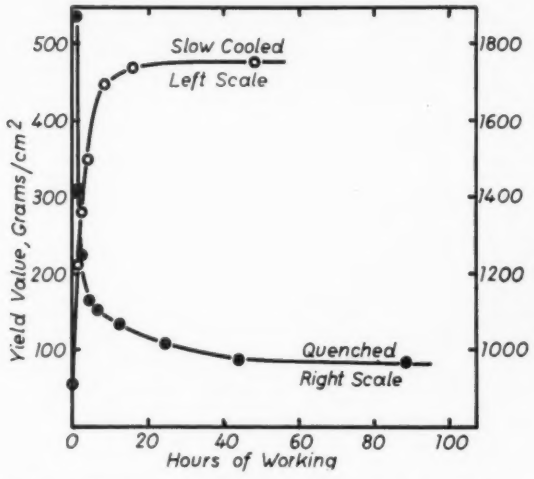
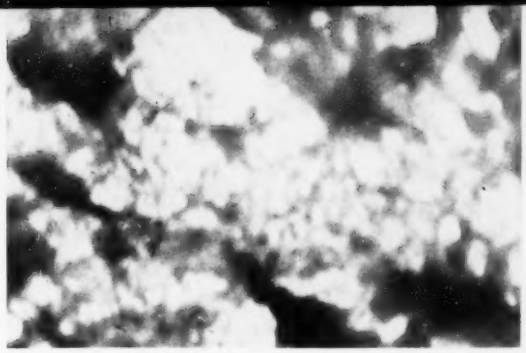
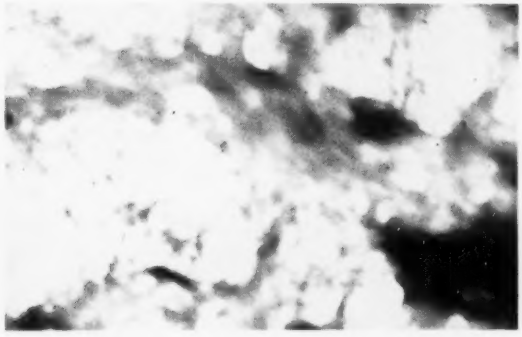


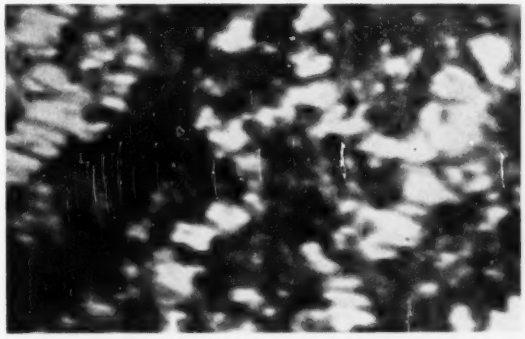
Fig. 7. Effect of Working on the Yield Value of Quenched and Slow-Cooled Systems of Hydrous Calcium Stearate in Cetane



A. Section of 45% Calcium Stearate Monohydrate, 55% Cetane Gel quenched from 155° C. Worked 20 strokes. Cetane removed by Evacuation.

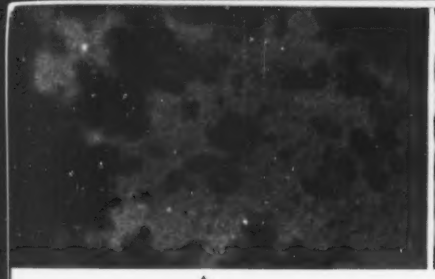


B. Section of 45% Calcium Stearate Monohydrate, 55% Cetane Gel quenched from 155° C. Worked 1 hour. Cetane removed by Evacuation.



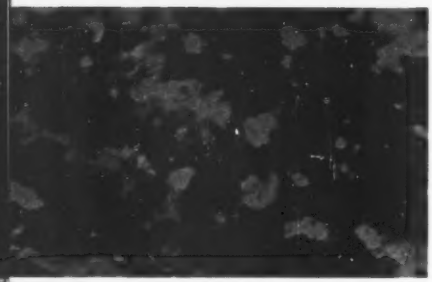
C. Section of 45% Calcium Stearate Monohydrate, 55% Cetane Gel quenched from 155° C. Worked 96 hours. Cetane removed by Evacuation.

Fig. 8. Electron Micrographs of Slices of Quenched, Worked Systems



A.

B.



C.

Fig. 9. Electron Micrographs of Slices of Slow-Cooled, Worked Systems

A. Section of 45% Calcium Stearate Monohydrate, 55% Cetane System, Slow-cooled from 155° C. Unworked.

B. Section of 45% Calcium Stearate Monohydrate, 55% Cetane System, slow-cooled from 155° C. Worked 24 hours in mechanical worker.

C. Section of 45% Calcium Stearate Monohydrate, 55% Cetane System, Slow-cooled from 155° C. Worked 96 hours in mechanical worker.

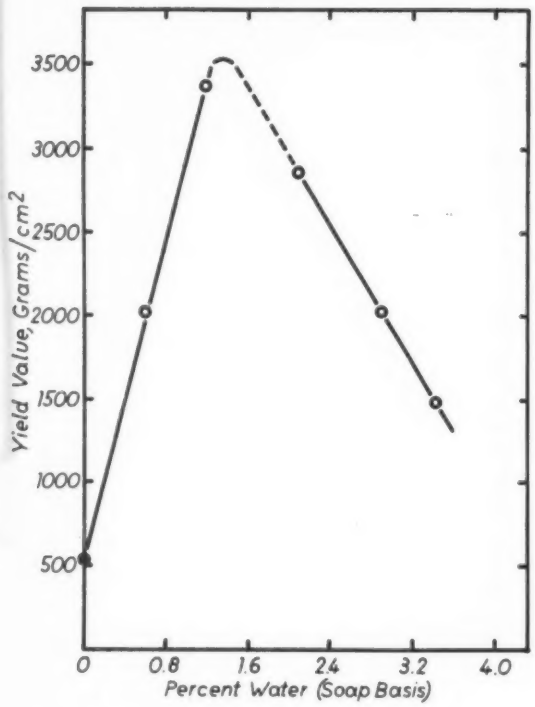


Fig. 10. Effect of Water on the Yield Value of Quenched Systems of Hydrous Calcium Stearate in Cetane

ous periods of working. These show that the irregular mesh-like structure of the soap residue is greatly coarsened but not entirely disrupted by the working.

Prolonged mechanical working of a slow-cooled system of the same composition (45 per cent calcium stearate monohydrate in cetane) gradually transforms the material into a soft grease, although its yield value is still much lower than that of the worked, quenched system, as is shown by the lower curve of Fig. 7, and it is quite unstable with respect to loss of cetane by syneresis. The electron micrographs of Fig. 9 show that the increasing yield value is matched by the development of a mesh structure similar to that of the quenched samples, but coarser and formed of more densely aggregated soap particles.

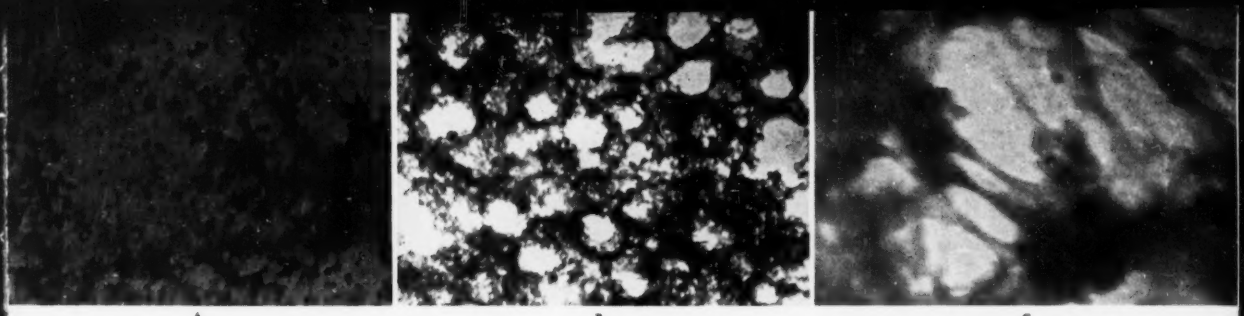
The rheological properties of the calcium stearate-cetane system are very sensitive to water content. The anhydrous soap does not yield a stable gel. With increasing water content up to 2.9 per cent (soap basis), the composition of the stoichiometric monohydrate, the stability of the system against liquid loss under pressure increases, and then decreases gradually as more water is incorporated (3). The yield value also passes through a maximum with increasing water content, but the composition of maximum initial yield value occurs at about 1.3 per cent water, as is shown by the data of Fig. 10.

The electron micrographs of Fig. 11 show that both well-developed, irregular, mesh-like structure and small size of primary particles are associated with systems of high yield value. Fig. 12, taken at higher magnifications, shows the variations in size and shape of the spaces in the mesh structure more clearly. The primary particles appear to be of the order of 100-300 A° in diameter, and to aggregate in short chains like beads on a string as well as in clumps, with the porous net structure formed by connecting the clumps with bundles of the strings.

Fig. 13 shows that the mesh structure disintegrates and the constituent particles agglomerate into coarser aggregates as the gel ages. This process is accompanied by granulation, extensive syneresis, and softening of the bulk systems.

DISCUSSION

Validity of the Electron Micrographs. The electron micrographs show the characteristic appearance of the soap residue which is left after freezing the heated sample, slicing it, floating the slices away from the microtome blade on a cooled



A. B. C.

Fig. 11. Electron Micrographs showing the Effect of Water on Secondary Structure

A. Section of a 45% Calcium Stearate, 55% Cetane Gel quenched from 155° C. Contains 0.00% Water. Cetane removed by Evacuation.

B. Section of a 45% Calcium Stearate, 55% Cetane Gel quenched from 155° C. Contains 1.17% Water on Soap Basis. Cetane removed by Evacuation.

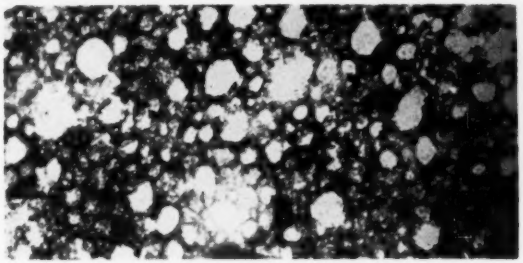
C. Section of a 45% Calcium Stearate, 55% Cetane Gel quenched from 155° C. Contains 3.32% Water on Soap Basis. Cetane removed by Evacuation.

water trough, collecting on a collodion-coated screen, removing the cetane by vacuum evacuation, and bombarding the resultant film with electrons. These operations are all conceivably capable of modifying the structure, but none of them seem likely to *create* a mesh work of the type of Fig. 12 (for example) from initially discrete particles. Consequently, the conclusion that the observed structure is exactly that of the soap in the initial sample is not fully justified, but that a structure of similar or more intricate organization does exist there can scarcely be any doubt.

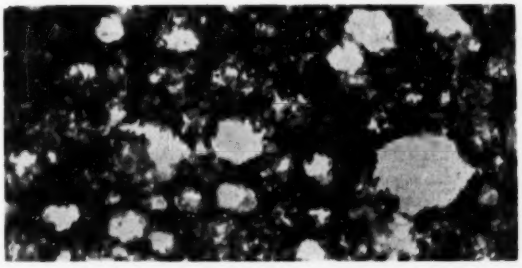
Summary of Experimental Findings. It has been established that in the system hydrous calcium stearate-cetane, the primary soap particles are not fibrous in crystal habit but form small irregularly shaped particles which agglomerate into clumps, interconnected with filamentous aggregates, to form an irregular, mesh-like structure. The clumps are large and dense and the filamentous structure negligible in systems that are syneretic or of low unworked yield value. Such systems may result from slow-cooling, insufficient water, or aging. Working coarsens the structure of quenched systems but does not entirely disrupt it, and at the same time decreases the yield value. Conversely, working promotes the formation of a more porous structure in slow-cooled systems, and also increases the yield value. An excess of water beyond that required for maximum yield value also coarsens the structure.

Interpretation. To state exactly why and how each of the observed phenomena occurs and whether and how it might be modified by appropriate pre-treatment of the sample is an objective that cannot be fully achieved at present. The loss of grease structure through re-crystallization processes on either slow-cooling or aging is not difficult to understand qualitatively. The aging effect presumably could be minimized by storage at low temperature and by using an oil having minimum true solvent power for the soap.

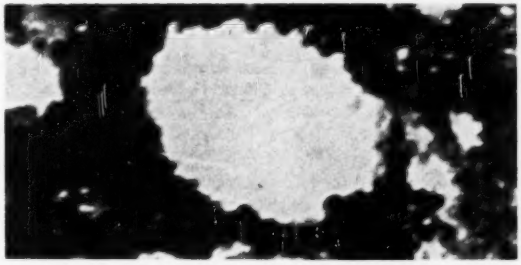
Quite possibly water is necessary to render the soap dispersible, this apparently being a necessary condition for the formation of highly developed secondary structure. The ionic calcium carboxylate groups will certainly tend to cohere



A. Section of 45% Calcium Stearate, 55% Cetane Gel quenched from 155° C. Contains 1.17% Water on a Soap Basis.

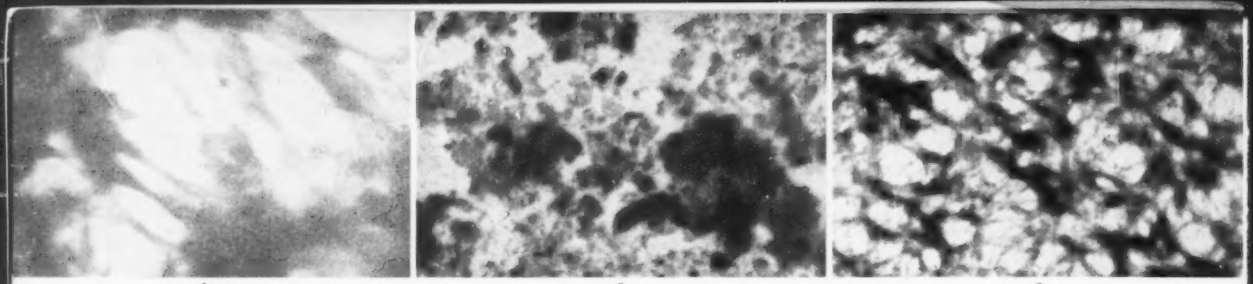


B. Section of 45% Calcium Stearate, 55% Cetane Gel quenched from 155° C. Contains 1.17% Water on a Soap Basis.



C. Section of 45% Calcium Stearate, 55% Cetane Gel quenched from 155° C. Contains 1.17% Water on a Soap Basis.

Fig. 12. Electron Micrographs of Gel Structure at varying Magnification



A. B. C.

D.

Fig. 13. Electron Micrographs showing the Effect of Aging on Secondary Structure

A. Section of 45% Calcium Stearate, 55% Cetane Gel quenched from 155° C. and Sectioned Immediately. Contains 3.32% Water on Soap Basis. Cetane removed by Evacuation.

B. Section of 45% Calcium Stearate, 55% Cetane Gel quenched from 155° C. and Sectioned 6 weeks afterwards. Contains 3.32% Water on Soap Basis. Cetane removed by Evacuation.

C. Section of 25% Calcium Stearate Monohydrate, 75% Cetane Gel quenched from 155° C. and Sectioned Immediately. Cetane removed by Evacuation.

D. Section of 25% Calcium Stearate Monohydrate, 75% Cetane Gel quenched from 155° C. and Sectioned after aging 2 years. Cetane removed by Evacuation.

strongly when brought into contact in proper orientation and to resist separation. Owing to differences in the environment around each calcium ion, a particle with less than the amount of water required for the hydrate may be more friable than either anhydrous or fully hydrated soap. This speculation applies to dispersion of the soap at elevated temperatures where thermal motions can produce very high local stresses and the "particles" being formed and disrupted may actually be in colloidal solution in the oil.

The effect of working this system can be viewed speculatively in the following manner. The primary particles are capable of cohering with varying tenacity depending on their relative orientation at the moment of contact, the relative orientations for strong adhesion including those geometrically suited to building up a mesh structure and also those geometrically suited to increasing the size of dense particle aggregates. As the grease is worked the weak aggregates are soon broken; the somewhat stronger ones are broken more slowly; and ultimately a state of balance is reached where the coarseness of the soap net and the mesh size are determined by the relative coherence of the soap particles in the two orientations.

Further Developments. The most important result of this work is the demonstration of the existence of an irregular, mesh-like soap structure in a particular system and of its direct relation to the consistency and stability of the system. Consequently, an attractive further development is in the direction of ascertaining to what extent this phenomenon is characteristic of other types of greases, and to determining the connection between the observable structures and changes in yield value or stability resulting from such variables as rate of cooling, tempering temperature, mechanical working, age hardening, and incorporation of additives to affect crystal habit. It is also a question of considerable interest and importance as to whether this mesh-like structure results from actual growing together of the particles, as in a sponge, or from a looser, mechanical effect, as in a log jam or brush heap.

A second group of projects which is becoming feasible involves attempting to verify the existence of the mesh-like structure independently and attempting to devise quantitative expression and experimental test for some of the hypotheses here advanced.

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Dr. Baker observes the image formed on a fluorescent screen inside the electron microscope.

Discussion of *Rheological Studies* AND ELECTRON MICROSCOPY OF CALCIUM STEARATE-CETANE GELS

by L. W. McLENNAN, Research Department
Union Oil Company of California

This paper by Dr. Vold and his collaborators raises a number of points upon which some of us would probably like further amplification. One point, for example, is the ingenious technique developed by the authors for preparing specimens through the use of a refrigerated microtome blade. Doubtless, Dr. Vold would be willing to demonstrate the technique as far as possible for those interested. Also, he might be willing to mention whether or not he has contemplated other similar special techniques for use in the further study of the soap-oil systems.

For those interested in a practical aspect of the work, attention is directed to Figure 10 wherein is clearly revealed the critical nature of the optimum water content in realizing maximum yield point. The particular grease under study has an interesting relationship in respect to cup grease manufacture.

There are two possibly controversial points upon which Dr. Vold might like to make further comment. First, it appears from the electron micrographs in Dr. Vold's work that the presence of solvent does exert a definite effect upon the aggregate form of the soap. In the work of Birdsall and Farrington, and of Ellis, referred to by Dr. Vold in this paper, the assumption seems to have been made that the solvent had essentially no effect upon soap structure. The same assumption seems to be indicated in Mr. Browning's work with lithium greases, as presented at New Orleans in 1949, although Mr. Browning showed no electron micrographs. Of course, it is understood that we are not speaking of the same soap-oil systems in every case. Would Dr. Vold attempt a reconciliation of these various points.

Second, in Dr. Vold's work, mechanical shearing of the sample appeared to break up the aggregates, whereas in Mr. Marusov's work, as described in the August *Spokesman*, appeared to increase the length/width ratio of the soap fibres. Again, we are dealing with different soap-oil systems, but possibly Dr. Vold would like to comment further upon the relation of working to soap structure.

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LUBRICATING GREASE

for the machines

This paper was presented by Mr. Davis before the annual meeting of NLGI in Chicago, Illinois, October 29, 1951.

I bring you a special message of regrets from Bruce K. Brown, the Deputy Administrator of the Petroleum Administration for Defense. He is sorry that he is unable to appear before you. When he learned that the pressure of business in Washington would make it impossible for him to come to Chicago at this time, he asked me to appear in his place. It seemed to be a reasonably good idea, and I accepted before I gave any serious thought to what I would say after I got here.

When I began to think about how little I knew regarding the fundamentals of lubricating grease, I was set back on my heels. So, if you notice a tendency in me to list backwards, it is because I have not recovered my equilibrium.

Your committee sent me a questionnaire asking whether or not I would want to use such standard props as a blackboard or a magic lantern. When I replied that I wouldn't need them, I think the program committee must have begun to realize that they had bought a package without a label, a package of doubtful content to tuck into the middle of a profound discussion on the rates of shear and the structure of gels.

Since I am unable to speak your language in grease technology, I would like to explain to you some of the broader aspects of defense mobilization and the problems now being encountered in the Petroleum Administration for Defense.

I am not an expert in the formulation of lubricating grease, but you must admit that when it comes to choosing a title for my speech, I got to the meat of the cocoanut. It is, "Lubricating Grease for the Machines of Defense." In writing my speech, I was thinking chiefly of two audiences—those who have not given this matter any particular thought and those who have given it some thought but still do not undersand the relationship of lubricating grease to the tools of defense. If, in these brief remarks, I can bring to these people some concept of the importance of lubricating grease to the defense effort, I will be more than satisfied.

In every mechanized operation, there is the important factor of lubrication which is seldom recognized. No single product of petroleum is more indispensable to successful operation than anti-friction bearing lubricants. Far back in antiquity, men found that to keep in operation the crudest tools or conveyances they had to have these lubricants. Fortunately, the improvement in lubricant techniques has kept pace with the advance of our industrial civilization, the keystone of which is the machine. Without lubricating grease, our industrial machines would break down. Without lubricating grease, the transportation industry would grind to a stop. Automotive and railroad power, the things that make this Country a nation on wheels, depend on grease. So do the marine and aircraft engines that carry us across oceans and over continents.

The importance of correct lubrication in our transportation economy has received too little recognition. Not because it is unimportant, but because it is taken for granted. Lubricating grease for military use, for instance, is not as spectacular a material as napalm or atomic weapons, but it is just as essential. Ordnance requires a vast range of lubricating grease, everything from launching grease to lubricants for minute mechanisms and parts. These requirements have taxed the resourcefulness and ingenuity of the compounder, but, in general, it can be said that there is a satisfactory product for every military application.

I am sure that you are tired of hearing about the age-old controversy over whether the making of grease is an art or a science. This much seems clear now: Whatever it may have been in years gone by, grease-making today has strong elements of both art and science, and there are continually growing emphases on scientific developments. Only a few years ago, research in petroleum and its derivatives was practically non-existent. Today there are more dollars spent on research than in any other industrial enterprise. To a large extent, the technology of grease lubrication and the search for improved methods of manufacture have reflected similar progress.

A glance at the scope of the papers being presented at this meeting will illustrate clearly the strides that have been taken in the search for greater knowledge of the properties and functions of lubricating grease. From such an expenditure of effort will come improved manufacturing methods, better per-

# of defense

C. E. Davis, Director
Refining Division
Petroleum Administration for Defense

formance, and longer life. The use of additives, both new and improved, holds great promise for the future. A continued expenditure of effort and money in that direction should be productive of highly beneficial improvements. Considerable progress is being made in the development of the silicones and di-esters for use as base oils and bentones for use as thickening agents for grease.

The matter of stability to bridge the requirement of overseas transit and lengthy storage periods needs increased attention, since demands for overseas shipments to E C A and N A T O countries will probably continue to rise in the years ahead.

Nearly all of the affirmative actions undertaken by the Petroleum Administration for Defense are based on careful program determinations. These point to the necessity for specific actions in the interest of defense mobilization to provide increased production, accumulate necessary stockpiles, and otherwise protect the increasing demand of the armed services and the civilian requirements. I would like to review briefly the present status of some of the more important phases of our activities.

One of the first determinations made was that in order to keep pace with the mobilization of the armed services and maintain adequate supplies for civilian consumption, it would be necessary to expand the productive capacity of the petroleum industry by one million barrels a day over the effective capacity on January 1, 1951. Although this expansion in capacity should be obtained as rapidly as possible, in recognition of the scarcity of critical construction materials such as carbon steel, alloy steel, copper, and aluminum, the program was scheduled over a period of three years. In order to meet the requirements of this program, it will be necessary to drill over 43,000 new oil wells each year, install thousands of miles of new pipelines, and build the equivalent of one hundred new refineries, each having a capacity of 10,000 barrels a day of crude oil. In order to induce rapid installation of this large increase in capacity, certificates of accelerated tax amortization have been recommended to the Defense Production Administration, under the provisions of the Defense Production Act. They cover a total of new capacity of 1,013,900 barrels per day of crude oil. Only about one-half of this amount had been certified by D P A before August 18, 1951, at which time all applications for certificates of accelerated tax amortization were placed in the "deep freeze" for a period of not less than sixty days to permit the review by Government of the whole subject of rapid tax amortization.

It is hoped that the new ground rules now being prepared in accordance with the procedures outlined in Mr. Charles E. Wilson's Directive No. 11 will be completed in the near future and that all applications now pending will be processed to completion without further delay. That the petroleum industry is willing to proceed as rapidly as possible with the projected refinery expansion is shown by the fact that P A D has received forms P A D 26 covering the requirements of controlled materials to represent increased capacity of approximately one million barrels per day. Of that amount, 800,000 barrels have been approved and construction materials allocated. The extremely tight material situation in the first quarter has made it necessary to withhold action on the remaining 200,000 barrels until the forward position on materials shows sufficient improvement to warrant the further allotment of critical materials. Every effort will be made to get these necessary projects under construction as soon as possible.

During the early days of the emergency, it was determined by the National Production Authority that benzene would be in short supply and that no significant increase in production from the coal-tar industry could be expected. Although benzene had been produced synthetically from petroleum for several years, there were no plans to develop the production of benezene on a large scale. In the face of mounting shortages of this important aromatic, the N P A presented to the petroleum industry the problem of providing 130 million gallons a year by the installation of new plant facilities. To induce investment of the vast amount of capital required, certificates of accelerated tax amortization were offered to interested applicants. It is interesting to note that sufficient applications were received to complete the program without delay. To date, certificates have been issued covering the full program of 130 million gallons of benzene a year, and production already has been increased to a rate of approximately

40 million gallons per year with many plants still to be completed. If more is needed, I am confident that the petroleum industry will find ways to make it available.

Although there have been shortages in many commodities during the past year, probably more publicity has been given to the sulphur scarcity than any other. Almost all of the sulphur used in the world is mined in the United States from deposits along the Gulf Coast in Texas and Louisiana. Increased domestic and export demands have placed a large burden on these normal sources of supply. Although the petroleum industry requires a substantial part of the total sulphur produced for the manufacture of sulphuric acid, it is not generally known that the industry is a net producer of sulphur. During the year 1951, industry sources estimate requirements for fresh acid at 638,000 long tons of sulphur, but through its own operations, the industry will release, 643,500 tons, or a surplus of 5,500 tons. In spite of this favorable balance, the recovery of additional sulphur from petroleum sources has been given high priority in view of the national shortage that still exists. With this encouragement, many new projects for the recovery of sulphur from spent acid or refinery gases are under construction or definitely planned which will provide approximately 190,000 long tons of additional sulphur by the end of 1952. This is particularly gratifying, since it not only will assist materially in relieving the acute shortage of sulphur but will also contribute to a reduction in atmospheric pollution.

When the Petroleum Administration for Defense was organized about a year ago, one of the first problems assigned to it involved the fast-disappearing supplies of tetraethyl lead. The necessity for building an adequate reserve of this essential ingredient for aviation and motor gasolines, in the event of an emergency, quickly became apparent. P A D Order No. 1 was issued, effective March 1, 1951, to eurtail the consumption of TEL in civilian motor gasoline in order to permit the accumulation of such a stockpile. This order so far has accomplished its objective, because the stockpile has been increasing exactly as scheduled. However, recent developments have filled the air with uncertainty and confusion. Briefly, this is what has transpired in the past few weeks. Effective September 1, 1951, the allocation of primary domestic lead to the TEL manufacturers was reduced to approximately 50 per cent of the previous level. Simultaneously, the supply of secondary or scrap lead practically disappeared from the market because the dealers refused to sell at then-existing price ceilings. However, within a short time, the TEL manufacturers were able to restore to normal their supplies of metallic lead by increased purchases from foreign sources at prices which, at that time, were not subject to control. We then took a deep breath, thinking that we were out of the woods for the time being. We thought it would not be necessary to consider an amendment to P A D Order No. 1, which might result in further lowering of the quality of civilian motor gasoline.

It was too much to expect that our serenity would continue for very long. On October 2, 1951, the Office of Price Stabilization took a double hitch in the lead situation and issued regulations which both helped and harmed the prospects of continued operation at existing levels. It helped to increase the production of primary domestic lead by raising the ceiling price from 17 cents to 19 cents per pound. It delivered what may be a knockout to the foreign supply by imposing a ceiling of 19 cents per pound, where no ceiling price existed before, and from which sources purchases had been made at approximately 22 cents per pound. A few days ago, OPS raised the ceiling price on scrap lead from 17 cents to 19 cents per pound, which should smoke more scrap out of the junk yards. Thus, we seem to be faced with a paradoxical situation in which we increase the production of metallic lead at home while we dry it up on foreign shores. What effect all these gyrations in price controls will have on the TEL position is difficult to predict, but it seems to be the consensus that trouble is just around the corner and that although all of the measures just reported will shake down in time to a reasonably well balanced position, we are likely to be in for trouble for several months at least.

A review of current shortages and supply problems would not be complete without reference to aviation gasoline. The demand for this always-important product has snowballed in recent weeks as a result of the shutdown of the Abadan refinery and substantially increased requirements from U. S. military sources. For the fourth quarter, the total deficit appears unmanageable under present operating conditions, and strong measures will be mandatory if we are even to approach the fulfillment of demand. The most important measures which were taken are contained in P A D Orders No. 3 and No. 4, and press releases have been issued recently about them. P A D Order No. 3 restricts to aviation gasoline the use of blending agents, including alkylate and provides for the maximum use of available raw materials suitable for the production of alkylate. P A D Order No. 4 prohibits the delivery for domestic use of commercial aviation gasoline containing less than 4 cc's of TEL and prohibits the delivery for export of commercial aviation gasoline containing less than 4.6 cc's TEL. Since half of the aviation gasoline supplied to commercial airlines in the United States has been blended to 4 cc's in previous months, no difficulty should be encountered in raising the remainder to the same lead content. All military aviation gasoline, since the beginning of World War II, has contained 4.6 cc's of TEL, including that used for passenger transportation. The Berlin and Pacific airlifts were fueled with gasoline of this lead content. All during World War II, commercial airlines received and used successfully aviation gasoline of the same TEL content as that supplied to the military. Although increased maintenance of engines will be necessary, past experience and practice would indicate no serious difficulties should be encountered. The decision to take this step was made only after the most serious consideration and after exhausting all other practicable methods of stretching existing production in time to meet the greatly increased requirements. Whenever it becomes apparent that the increase in production obtained by this measure is no longer required to meet essential volume requirements, it is reasonable to assume that the order will be withdrawn immediately. The present outlook is for a continuation of the tight position in aviation gasoline at least until the middle of next year.

Although the industry made available to the military services during World War II lubricating oils which met all requirements both as to quantity and quality, it could do it

only because of the drastic curtailment in civilian consumption through the rationing of motor gasoline. In all likelihood, the same thing would happen now if we had an all-out war. During the mobilization period, since we are not confronted by the necessity for curtailment of civilian uses, the growing demand by the armed services will have this result: Total requirements will exceed the productive capacity of the industry.

The Program Division of the Petroleum Administration for Defense has completed a study of the supply and demand situation which indicates a shortage of HVI production. The study indicates that facilities should be installed to increase production by 15,000 barrels a day. It may be of interest that applications for accelerated tax amortization have already been received to cover more than 6,000 barrels per day of additional HVI capacity.

A survey of refiners using the bulk of additives and the additive manufacturers producing these materials reveals that there is a shortage of detergent-type lube oil additives. Other additives, such as V. I. improvers, oxidation and bearing corrosion inhibitors, and gear oil compounds apparently are being produced in sufficient volumes, and the facilities seem adequate to meet anticipated requirements. Applications for accelerated tax amortization have been received already covering new facilities with productive capacity to meet the major portion of the indicated requirements, which have been estimated at 15 million pounds per month.

I have mentioned a number of programs. You may well ask: "What about lubricating grease?" If it is as important as I have said it is, why is there no program to increase production for defense mobilization or to assist the manufacturers with the multitude of problems arising from the impact on business caused by the mobilization effort? The Petroleum Administration for Defense has not found it necessary to operate in all of the fields related to petroleum and gas, and at present, it does not have the staff to do so. It functions on programs that are established on the basis of determinations of essentiality for the mobilization effort. It is the desire of P A D to avoid all forms of control that are not required to meet the programmed requirements of the military services and maintain adequate supplies for civilian use. To the greatest extent possible, complete freedom of action is left to members of the industry so that they may carry on their business in the field of competitive free enterprise, unimpeded by governmental controls. The P A D is properly called an emergency defense agency. As the name implies, it was created for the purpose of promoting expansion necessary to meet requirements for crude oil and petroleum products as established by the program determinations of the Defense Production Administration.

No one has determined that a shortage of lubricating grease exists in this country, and it is the current belief that there is adequate productive capacity to meet all foreseeable military and commercial requirements during the mobilization period. This is a position that is far from unique, since there are also no authorized programs in P A D covering lubricating oils, wax, asphalt, and many other products.

A word about additives for lubricating grease. We under-

(Continued on Page 24)

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Patents and Developments

WATER RESISTANT GREASES

Recent work in the field of greases has shown that inorganic gels may be employed instead of fatty soaps to impart grease consistency to oils. Such greases, however, are susceptible to loss of structure under influence of water or aqueous media.

It is possible to increase the resistance of inorganic gel greases to the deleterious action of water. For example, soaps and amines have been disclosed for this purpose in U. S. Patent 2,554,222. A more recent patent issued to Shell Development Company (U. S. 2,573,650) discloses the use of non-metallic hydroxy aliphatic organic compounds having at least 8 carbon atoms, as suitable for this purpose. The water resistance is imparted to the grease by first incorporating the hydroxy compound in the grease, and then heating the composition for a short time at an elevated temperature. The grease may be softened by incorporation of small amounts of such hydroxy compounds, while, upon addition of larger amounts of these agents, the grease may be made harder than the original unmodified grease.

The preferred classes of hydroxy compounds suitable for this purpose are hydroxy fatty acids and their esters, monohydric alcohols, polyhydric alcohols, esters of glycols and glycerols, etc. Specific examples of suitable compounds are hydroxy stearic acids, 9-10 dihydroxy stearic acid, 3, 12-dihydroxy palmitic acid, 9, 10, 16-trihydroxy palmitic acid, 12-hydroxy ricinoleic acid, 19-hydroxy nonadecanoic acid, wool wax acids, etc. A particularly effective material is the butyl ester of 12-hydroxy stearic acid. Also suitable are octane diol, octyl alcohol, dodecyl alcohol, etc. Glycols having widely spaced hydroxyl groups do not tend to soften the grease and hence are preferable.

The amount of hydroxy compound should vary preferably from 15% to 30% of the weight of the gel. It is better stated in terms of equivalence of effective hydroxyls per 100 gms. of silica gel, the preferred hydroxy equivalent being .05 to .08 per 100 gms. of silica. The gels should be used in the non-shrunken state such as may be obtained in the aerogel formation. Greases of this type are described in U. S. Patent 2,260,625. However, hollow spheroidal gels, such as those described in U. S. Patent 2,449,253, are also suitable.

One disadvantage of the aerogels is their high bulk density. This density can be reduced by wetting the aerogel with acetone or isopentane and removing the solvent by warming or by vacuum. One method of preparing greases from inorganic

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gels without resorting to aerogel formation involves dispersing an alcoholate or ester of a metallic substance in the lubricating medium and subsequently hydrolyzing to form the gel in situ, then removing the alcohol or other hydrolysis product.

Among the hydroxy compounds which were found to materially improve water resistance under both hot and cold conditions of the silica grease are glyceryl monostearate, 12-hydroxy stearic acid, hydrogenated castor oil, cetyl alcohol, 1, 2-dodecane diol, and 1, 10-decamethylene diol.

NEWS ITEMS

British-American Oil Co. is planning a new $1,500,000 grease plant at its Sarnia refinery, to produce 15 million pounds per year, thereafter reducing its imports from U. S. to a minimum.

Europe's largest grease plant, with 20,000 long ton capacity, was opened at Trafford Park, Manchester, England, recently. Shell Oil and Anglo-Iranian are behind the enterprise.

LUBRICATING GREASE FOR THE MACHINES OF DEFENSE

(Continued from Page 21)

stand that certain materials, such as lithium, which is used for the compounding of all-purpose grease, are becoming increasingly difficult to procure. We understand that the Munitions Board Office of Petroleum Programs is now studying availability as compared to estimated forward requirements, and I can assure you that P A D is ready to lend whatever assistance is required to make a determination of the forward position and the possible need for increased production.

Although, at present, there is no production program in P A D on lubricating grease, all of your operations depend upon P A D as claimant agency for the maintenance and construction materials required. You must also look to this agency for your container supply. The M R O procedure for ordering your requirements for maintenance materials is now well established and functioning smoothly. We have not heard of any serious difficulties in that category. All new projects that require the use of more than $5,000 worth of controlled materials must be submitted to P A D on Form P A D 26 for authority to proceed with construction. This procedure also is now well established and its effectiveness is limited only by the amount of materials available. Since the requirements for critical materials in the grease industry are relatively small in volume, we do not anticipate any difficulty in supplying the basic requirements for normal in-plant maintenance or construction. New projects of substantial size would probably meet with considerable delay because of the present shortage of controlled materials.

Containers and packaging materials for the need of lubricating oil and grease manufacturers are obtained under N P A Order M-75 for drums and pails and Order M-25 for cans. Generally speaking, these orders allow the use of cans at the rate of 90 per cent of a base period, established either on 1949 or 1950 usage, whichever is greater.

Almost all companies have adopted conservation measures, such as the use of returnables and the sale of lubricating oil in bulk. P A D believes that with these measures, the allocation of steel now being received is adequate for the industry needs on a whole.

On direct, defense armed service orders, and for atomic energy needs, the users of cans may extend a priority to their can suppliers for their requirements for drums and other containers. This is over and above the amount obtained under the 90 per cent allocation.

P A D recognizes that certain manufacturers of specialty items, such as oils and greases needed by the expanded machine tools and steel industries, require more containers than the quota limitations allow. These manufacturers may apply for increased allotments in order to take care of these needs. In the past, P A D has helped to secure all of the requirements for such direct defense-related projects.

Although essentially the grease industry is an integral part of the petroleum industry, it is recognized that to a large extent it is composed of grease manufacturers, both large and small, who have very little connection with the petroleum industry other than as a source of raw material, primarily lubricating oils. Because of this, these many specialized firms, comprising a large segment of the industry, may feel that it is difficult to compete for time, as well as recognition, in Washington, where the oil companies handle their grease problems along with similar problems relating to their oil business. Since P A D is conscious of its responsibility to all segments of the industry which have been placed under its jurisdiction for the execution of the provisions of the Defense Production Act, any suggestions will be appreciated about how the relations with the grease industry can be improved in the interest of mobilization for defense.

It is understood by everyone, I think, that P A D functions primarily in the fields of production and supply and has no responsibility in the matter of prices, which is the province of the Office of Price Stabilization. Many people are feeling the squeeze between increasing costs and frozen prices, but in that connection, we can only be sympathetic. We can't act.

In conclusion, I wish to emphasize that the success of the mobilization effort will depend on close cooperation between industry and Government. With the spirit of teamwork that has always prevailed when the chips are down, we, in Government, look forward with confidence to the full achievement of all essential goals.

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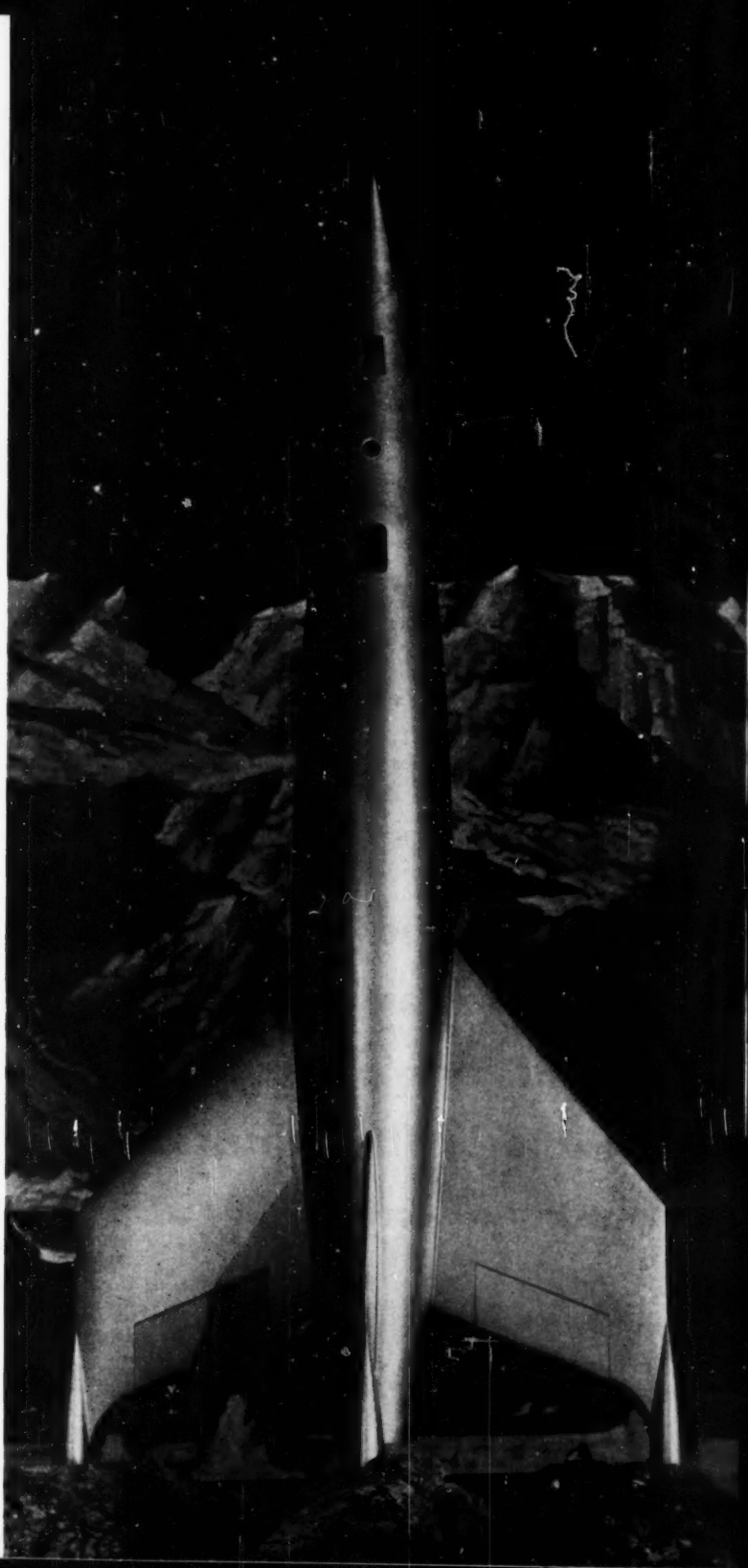

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WESTLAND OIL COMPANY JOINS N. L. G. I.

The Westland Oil Company of Minot, North Dakota, is an independent petroleum marketing company that distributes its own private brand products over a large area of the Upper Midwest. Its marketing area comprises some 65,600 square miles in a territory 525 miles long and 125 miles wide that includes most of northern North Dakota and the northeastern section of Montana.

Westland is a pioneer marketer in the Upper Midwest. It originally developed as an outgrowth of a garage and power plant operation established at Scobey, Montana, in 1913 by R. J. Coughlin, president of Westland since 1923. The sale of petroleum products was a natural extension of the garage business. By 1919, Mr. Coughlin had expanded his bulk plant operation, started in 1916, to seven petroleum plants operating in the northeast Montana area.

The Westland Company was formed in the fall of 1919 through a merger of the Coughlin interests with the Gray-Lindemann Oil Company of Redstone, Montana, which also operated seven petroleum bulk plants located in adjoining towns in the northeast Montana area. Henry Gray was named president of the new company, R. J. Coughlin, vice-president and L. C. Lindemann, secretary-treasurer. In 1923, Mr. Coughlin became president upon the retirement of Mr. Gray. Headquarters of the company were moved from Scobey, Montana, to Minot, North Dakota, in 1927 to centralize distributing for the operation which had by this time spread into North Dakota. Mr. Lindemann retired as secretary-treasurer in 1949 and was succeeded by Fred Brett who still holds the office.

The company's operations cover a diversified field of petroleum marketing. It distributes its own brands of gasoline, motor oils, greases, fuel oil and other light oils through its 35 bulk plants and 53 service stations located in the territory it serves. Present bulk facilities provide storage of more than two million gallons of gasoline and fuel oil. Largest storage plant facilities are located at Minot where a three and one-half acre tract of land with a 452-foot railroad siding also serves the company's propane plant and trucking terminal. Dual tank car unloading facilities add much to the efficiency in product handling at this plant.

The distribution of LP gas was begun in 1941 and has steadily grown since the inception of this phase of the business. Besides the Minot propane plant, others owned by the company are located at Scobey, Montana, and Crosby, Kenmare, Williston, Bottineau, Harvey and Parshall in North Dakota. Each plant is provided with automatic equipment for filling two to four cylinders at one time, and for filling propane bulk trucks for rural deliveries. Total propane storage capacity in all plants exceeds 200,000 gallons. Five tank cars are owned by the company and are used to transport propane to the bulk plants. Three semi-trailer trucks are used in distributing bottle gas in cylinders and to supply petroleum products to the many dealers throughout the territory. Currently, the company is supplying gas for use in oil well drilling activities in the area.

Probably the most interesting and one of the oldest of its operations is Westland's own oil compounding and grease manufacturing plant where its private brands of lubricating oils and greases are manufactured. Facilities of the plant take up approximately 6800 square feet of floor space in the company's main building at Minot. Here, Westland's private brands are produced. Recent installation of a "grease mill," used in the formulation and homogenization of grease, is in keeping with the company's policy of maintaining highest standards of quality in the products it sells. Two 2,000-gallon oil blending vats, one 4,000-pound grease manufacturing vat, canning and packaging equipment, drum cleaning and painting equipment and bulk oil storage capacity of 95,000 gallons comprise the facilities of the compounding plant.

The original compounding plant, built by Westland at Scobey in 1920, was the first installation of its kind in the Upper Midwest. This plant was moved to the new headquarters at Minot in 1927.

Another phase of operations is that of distributing T B A merchandise. Its 32 company-owned service stations, leased to private operators has proved to be a steady source of T B A sales volume. In addition to the company's own outlets, more than 200 outside dealers are being supplied with more than 5,000 different items including two major tire lines, batteries, accessory items and garage and service station equipment handled by the company. The T B A distributing department, housed in a convenient downtown location, also stocks such LP gas appliances as ranges, space heaters, furnaces, water heaters, and stock tank heaters. Oil burner heating equipment and accessories are also a part of the appliance distribution.

Recently, the company reopened its recapping and vulcanizing plant, closed

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since 1947. This move was necessitated by the need of the tire dealers in the area served to give complete tire service. Present equipment is of the latest type and permits vulcanizing all sizes of passenger and truck tires and recapping passenger tires from 600x16 in size through 820x15. Truck recapping is done in sizes 600x16 through 1100x20. This four-man operation is currently recapping 24 passenger tires and 20 truck tires per day. Staggered hours permit one man to work an evening shift "cooking recaps." Most of the recapping business emanates from the present tire dealers supplied by Westland's T B A operation.

The company, with R. J. Coughlin as its president, has as its vice-president and general manager, J. D. (Jack) Coughlin, oldest son of the founder. The younger son, Richard J., Jr., is manager of the Scobey bulk and propane plant and service station. Other executives are Fred Brett, secretary-treasurer; C. D. Bruce, 2nd vice-president; Forrest Baker, general sales manager; B. G. Grudem, director of statistical controls; Willard Benton, manager of the compounding plant; J. R. Elder, supplier; E. A. Granter, director of procurement; Leonard Macheel, supervisor of petroleum sales; Fred Grawe, supervisor of propane sales and service; Frank R. Phipps, assistant sales manager; and H. N. Nappen, master mechanic.

The company believes it has maintained a high level of employee relations. A pension plan, insurance programs and a profit sharing plan have been instrumental in contributing to the company's continued success. A recent breakdown of statistics shows that the combined years of employment of the ten men with eleven years of service or over have devoted a total of 191 years to the job of distributing, selling, handling and marketing products of the house of Westland. Total of 101 employees represents 527 years of service, or based on a 40-hour week, 1,096,160 man hours of service to the company.

Under the pension plan, the amount of monthly retirement income is approximately two per cent of the employee's average monthly salary for each year of participation in the plan multiplied by the number of years he was a member. The plan also provides a total and permanent disability income of a minimum of $25 per month for life for any employee totally and permanently disabled.

The amount of net profits disbursed to the employees under the profit sharing plan is determined by a specific formula based on the company's profits. An employee may receive from the profit sharing fund up to a maximum of 15 per cent of his basic compensation in any one fiscal year. At the end of the year the company deposits the employee's share of the profits in a trust fund. During the first five years the plan was in operation, the employees received $143,582 as their share of the profit, with an average profit sharing income per employee of $451.52 per year.

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PEOPLE in Your Industry

Paul E. Rapp

PAUL E. RAPP BECOMES ASSISTANT TREASURER AT FOOTE MINERAL

Paul E. Rapp, formerly Senior Economist in the Industrial Chemical Division of O.P.S., has now joined Foote Mineral Company as Assistant Treasurer. Mr. Rapp graduated from Cornell as a Mechanical Engineer, later did post-graduate work in economics, accounting and statistics of N.Y.C. Initially with Bethlehem Steel, he has been affiliated with several financial institutions and spent eleven years with Barret Division of Allied Chemical & Dye Corporation. Early this year he left Allied to join O.P.S. and subsequently resigned to take up his new position with Foote. Mr. Rapp is a member of the Society for Advancement of Management and the Cornell Society of Engineers.

CYRUS S. GENTRY BECOMES VICE-PRESIDENT OF APIC

Cyrus S. Gentry, vice-president and general counsel of Shell Oil Company, has been elected chairman of the American Petroleum Industries Committee of the American Petroleum Institute.

Mr. Gentry succeeds Oscar John Dorwin, vice-president and general counsel of The Texas Company, who has served as A. P. I. C. chairman during the past three years and will now continue as a committee member.

Mr. Gentry was first appointed a member of the A. P. I. C. in 1941, shortly after he was made Shell's general counsel and secretary. In 1944 he became vice-president of Shell and the same year was elected secretary of the A. P. I. C. in which capacity he has served since that time.

A native of Illinois and recipient of a degree in jurisprudence at Oxford University in England, Mr. Gentry joined Shell in 1933 in St. Louis and four years later was transferred to New York where he rose to his present position.

Joseph P. Walsh, general counsel of Sinclair Oil Corporation, was elected secretary of the A. P. I. C. to replace Mr. Gentry. Mr. Walsh first became a member of A. P. I. C. in 1947, shortly after being named general counsel of his company. For a number of years he served on A. P. I. C.'s advisory committee on excise taxation. Mr. Walsh is a native of Brooklyn.

He graduated from St. Francis College, received his bachelor of laws degree from Fordham and doctor of jurisprudence from the Brooklyn Law School of St. Lawrence University. He first became a member of the Sinclair legal department in 1928.

Staff changes feature the retirement of Baird H. Markham after 18 years as director of the A. P. I. C. and the appointment in his place of John H. Bivins, formerly associate director.

Mr. Bivins' association with the A. P. I. C. began almost with its inception. Born in Birmingham, Ala., he later moved to Mississippi. He was graduated from Cumberland University and admitted to the Mississippi Bar. He was appointed secretary of the Mississippi committee administering the code of fair marketing practices and later became secretary of the Mississippi Gasoline Tax Evasion Committee.

Mr. Bivins served subsequently as secretary of the Mississippi Petroleum Industries Committee, and in 1933 was asked to join the A. P. I. C. staff in New York as assistant to the director. In 1941 he was named assistant director and early in 1951 was made associate director.

Newly-named assistant director is Adam J. Rumoshosky, who has been serving as assistant to the director since early this year. Mr. Rumoshosky, a native of North Creek, N. Y., is a graduate of Wesleyan University and received his masters degree at New York University. He joined the A. P. I. C. staff in 1937 as an economist and has served as an administrative assistant and manager of the publicity section.

HARRY M. BRUBAKER JOINS WITCO CHEMICAL COMPANY

Mr. Harry M. Brubaker has been appointed assistant sales manager of the Carbon Black Division of Witco Chemical Company. He will occupy offices at 311 Evans Building in Akron, Ohio.

Before joining Witco, Mr. Brubaker was with B. F. Goodrich's Hycar Division, the Phillips Chemical Company, and the Sid Richardson Carbon Company.

A P I MAKES D. R. WAUGH SUPERVISOR OF FIELD OPERATIONS FOR O I I C

Promotion of Donald R. Waugh, of Boston, to the post of national supervisor of field operations for the Oil Industry Information Committee of the American Petroleum Institute was announced by H. B. Miller, director of the Department of Information and executive director of the committee.

Mr. Waugh, district representative in charge of the New England District for four and one-half years, succeeds James S. Haskins, who resigned December 31. A native of Philadelphia, Mr. Waugh

(Continued on Page 38)

SUPPLIERS OF MATERIALS FOR MANUFACTURING LUBRICATING GREASES

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Technical Committee Column

Chairman T. G. Roehner, Director of the Technical Service Department, Socony-Vacuum Laboratories

The memberships of two Subcommittees were changed at the Annual Meeting of the Technical Committee. The present memberships are the following:

EDITORIAL SUBCOMMITTEE

Mr. T. E. DeVilliers (Chairman), Cities Service Oil Company.

Dr. R. K. Smith, Kendall Refining Company.

Mr. J. B. Stucker, The Pure Oil Company.

Mr. H. C. Zweifel, Richfield Oil Corporation.

SUBCOMMITTEE ON THE PROCUREMENT OF TECHNICAL PAPERS FOR PUBLICATION IN THE INSTITUTE SPOKESMAN

Mr. C. J. Boner (Chairman), Battenfeld Grease & Oil Corporation, 3148 Roanoke Road, Kansas City 8, Missouri.

Mr. J. Duray, Precision Scientific Company, 3737 West Cortland Street, Chicago 47, Illinois.

Mr. H. M. Fraser, International Lubricant Corporation, P. O. Box 390, New Orleans, Louisiana.

Mr. L. W. McLennan, Union Oil Company of California, Research Department, P. O. Box 218, Brea, California.

Mr. J. M. Musselman, Standard Oil Company (Ohio), Midland Building, Cleveland 15, Ohio.

Mr. N. H. Ruston, Emery Industries, Carew Tower, Cincinnati, Ohio.

Addresses are given here with the objective of encouraging correspondence regarding leads for papers for *The Institute Spokesman*. In addition to articles by authorities on the subjects covered, the Technical Committee wants to promote papers from young technologists who are working on lubricating grease problems. Both Subcommittees are ready to assist the new authors with constructive comments.

The A B E C- N L G I Cooperative Committee on Grease Test Methods and the Joint Committee on Lubricating Greases for Railroad Antifriction Journal Bearings will meet on January 22 and 23, 1952, respectively. It is hoped that in the former, final steps will be taken for preparation of an A B E C-N L G I Technical Bulletin on precautions that should be observed to avoid bursting of seals of bearings lubricated with high pressure greasing equipment. The main objectives of the latter meeting will be to obtain decisions regarding laboratory and service tests to define the properties required for lubricating greases for the subject application.

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Your Industry NEWS

LUBRICATION COMMITTEE WILL HOLD MEETING FEBRUARY 18-19 IN DETROIT

The Lubrication Committee of the Division of Marketing of the American Petroleum Institute will hold its first meeting of the new year in the Book-Cadillac Hotel, Detroit, on Feb. 18-19.

G. T. Dougherty, secretary of the committee, announced that an "outstanding program" is being developed for the two-day meeting.

He said the names of the six speakers who will address the sessions will be announced later.

Dougherty also expressed hope that the results of the letter ballot on the proposed change in crankcase oil nomenclature will be available for the meeting.

The Lubrication Committee's second meeting of the year will be held at the Mayo Hotel in Tulsa, Okla., on May 27 and 28. This is a departure from the normal procedures since the second meeting, in the past, has been held in conjunction with the Division of Marketing's spring meeting. The Marketing meeting will be held in Boston on May 19 and 20—a week in advance of the Lubrication meeting.

Other meetings of the Lubrication Committee will be held in Atlantic City, N. J., in September, and in Chicago in November.

EMERY DIESTERS AVAILABLE FOR SYNTHETIC LUBRICANTS

Three Emery diesters are now available to manufacturers of synthetic lubricants and specialty greases. Two are esters of azelaic acid, and the third is the dibutyl ester of Emery 955 Dimer Acid (di-linoleic acid). All three diesters are characterized by low pour points, high flash and fire points. An important feature is their excellent viscosity-temperature relationships.

A bulletin describing these products is available on request. Also contained are their temperature viscosity curves and comparisons with other diesters.

Write Emery Industries, Dept. 5, Carew Tower, Cincinnati 2, Ohio, for samples and descriptive bulletin.

BAROID OFFICIALLY OPENS NEW HEADQUARTERS

The official opening in Houston of new administrative headquarters of the Baroid Sales Division, National Lead Company, was celebrated by over 1500 oil men in November. The Baroid organization supplies drilling mud operations from the new building at 2404 Danville St., Houston, Tex.

Guests attending the celebration were taken on guided tours of the new quarters. The building is located on a four-acre tract and has been designed to provide greater service facilities for Baroid's growing operations. A two-story structure of stone, brick, and glass, the building has a 224-foot frontage on Danville Street, on Houston's southwest side.

The new building contains extensive laboratory facilities for organic and analytical chemistry, mud analysis, and instrument design, foundry and training laboratories, mills for grinding raw materials, complete photographic and printing facilities, together with a technical library directed by a professional librarian. Ultra-modern facilities have been provided for order-handling, stock records, and other aspects of customer service.

George L. Ratcliffe, General Manager, stated that in addition to headquarters in Houston, division headquarters are also maintained in Los Angeles and Tulsa. Field service centers are operating now in all leading oil fields. The firm's products are sold through 500 distributors, providing rush service in every active drilling area. Over 150 Baroid field service engineers in specially equipped cars carry Baroid service direct to oil fields of the United States and Canada.

Mr. J. A. Martino, President of National Lead Company, was on hand for the ceremony, accompanied by other top executives of National Lead Company. He remarked, "About 165 of our people will now be working together in the new building — technicians and engineers, scientists in the research department, the sales staff when not on the road, as well as clerical and administrative personnel."

Baroid has served oil men since 1926. Its present service includes a complete line of drilling mud products, mud testing equipment, well logging service, and complete field and laboratory engineering services.

Baroid produces much bentonite, the raw material for Aquagel, with large properties at Colony and Clay Spur, Wyoming, and a mine at Hector, California. Baroid produces barytes, the raw material for Baroid, with mines and plants at Fountain Farm, Missouri; Magnet Cove, Arkansas; Merced, California; and Battle Mountain, Nevada. There are also extensive processing plants at Texarkana and at Houston.

Baroid Sales Division, National Lead Company, opens its new main offices at 2404 Danville Street, Houston, Texas.

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DEEP ROCK PLANS NEW UNIT AT CUSHING

Deep Rock Oil Corporation has awarded a contract to the M. W. Kellogg Company for a new lubricating oil plant to be built at its Cushing, Oklahoma, refinery, W. J. Carthaus, vice-president, manufacturing and research division, announced.

The new unit will utilize the propane deasphalting and the phenol solvent refining processes to produce high quality lubricating oils. Its capacity will be 930 barrels daily of finished oils, a substantial increase over the existing lube oil plant. Engineering has been started, and the expected completion date is December, 1952.

In addition to the solvent extracted lubricating oils, Deep Rock will continue with the production of the widely accepted 'G' cylinder stock in increased quantities.

In building a new plant with increased capacity, Deep Rock is anticipating a higher demand for top quality lubricating oils in the years ahead. One reason for this is the program of the company's marketing division, called the Deep Rock Plan. Over the past two years, Deep Rock has gradually turned all of its company-owned bulk plants and service stations over to independent businessmen. The management expects that these independent businessmen will increase the company's sales volume.

In making the announcement, Mr. Carthaus said, "This new lubricating oil plant is another step in our extensive modernization program for the Cushing refinery. It is in line with our determination to have all of our facilities in the same superior competitive position that our gasoline and fuel oil plant occupy today. The production from the new plant will extend the Nation's margin of safety in war and contribute to a rising standard of living in peace."

Certain auxiliary facilities for the new lube plant such as additional tankage, water cooling tower, and other off-site units, will be constructed by The Refinery Engineering Company of Tulsa.

Deep Rock's Cushing Refinery with its 18,000-barrel daily capacity, has undergone many changes in the post-war period. Major new construction recently completed includes a crude still, fluid catalytic cracking unit, office buildings, and a research laboratory.

Only a few weeks ago, the company announced that construction would start soon on a new blending and packaging plant for motor oils. The Chemical Plants Division of Blaw-Knox Construction Company has the contract for this refinery addition.

A P I EARNS AWARD FOR PUBLIC RELATIONS

For its outstanding work in promoting better public understanding of the oil industry, the American Petroleum Institute has been awarded a "Certificate of Public Relations Achievement" by the American Public Relations Association.

The trophies and certificates earned in A P R A's Annual Awards Competition, together with the accompanying citations, are among the most coveted in the country.

The Oil Industry Information Committee, which plans and operates the Institute's public relations program, received the certificate at the association's seventh annual convention in Philadelphia recently. A score of leading American businesses in various fields were similarly honored.

The citation which accompanied the certificate lauded the O I I C program for its "astute understanding and skill" in pinpointing for the American people the significant facts about the oil industry's role in the nation's economy. Full text of the citation reads:

"The universality of the publics to be reached characterized the highly successful Public Relations Program of the American Petroleum Institute. This program was based on objectives for which unanimous approval constituted a prerequisite. Astute understanding and skill were evidenced in utilizing the widest range of media to carry to the publics concerned an educational program emphasizing the significant facts in the American economy of the oil industry as represented by its many competitive, privately-managed companies."

(Continued on Page 38)

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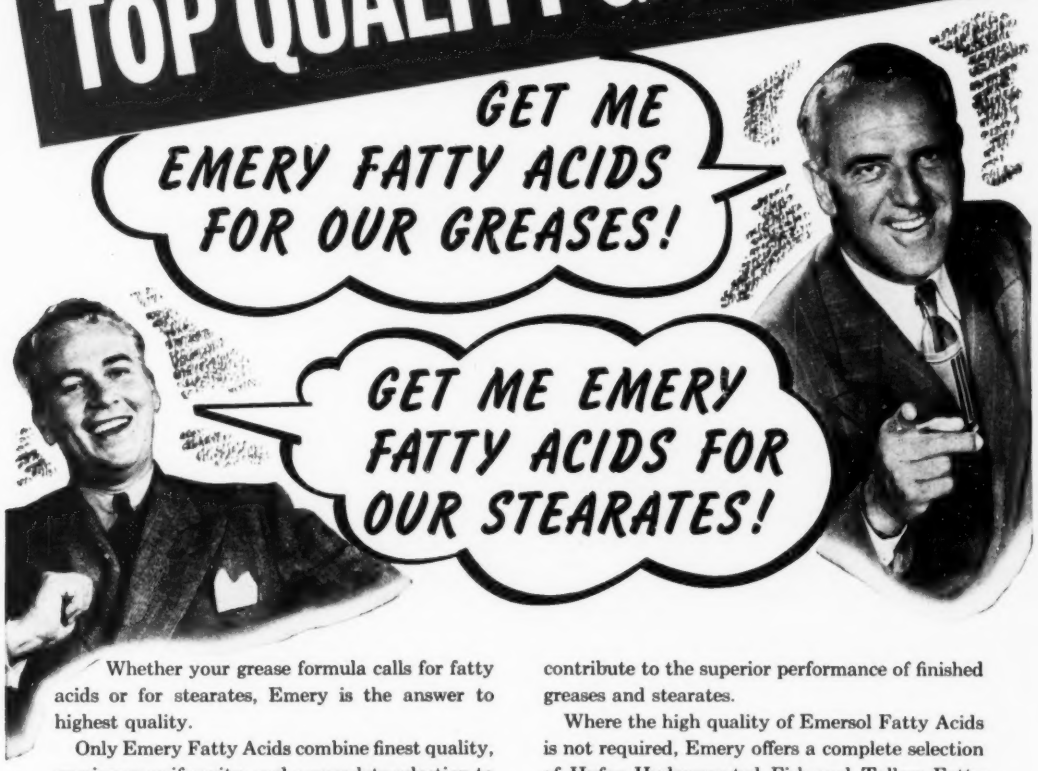

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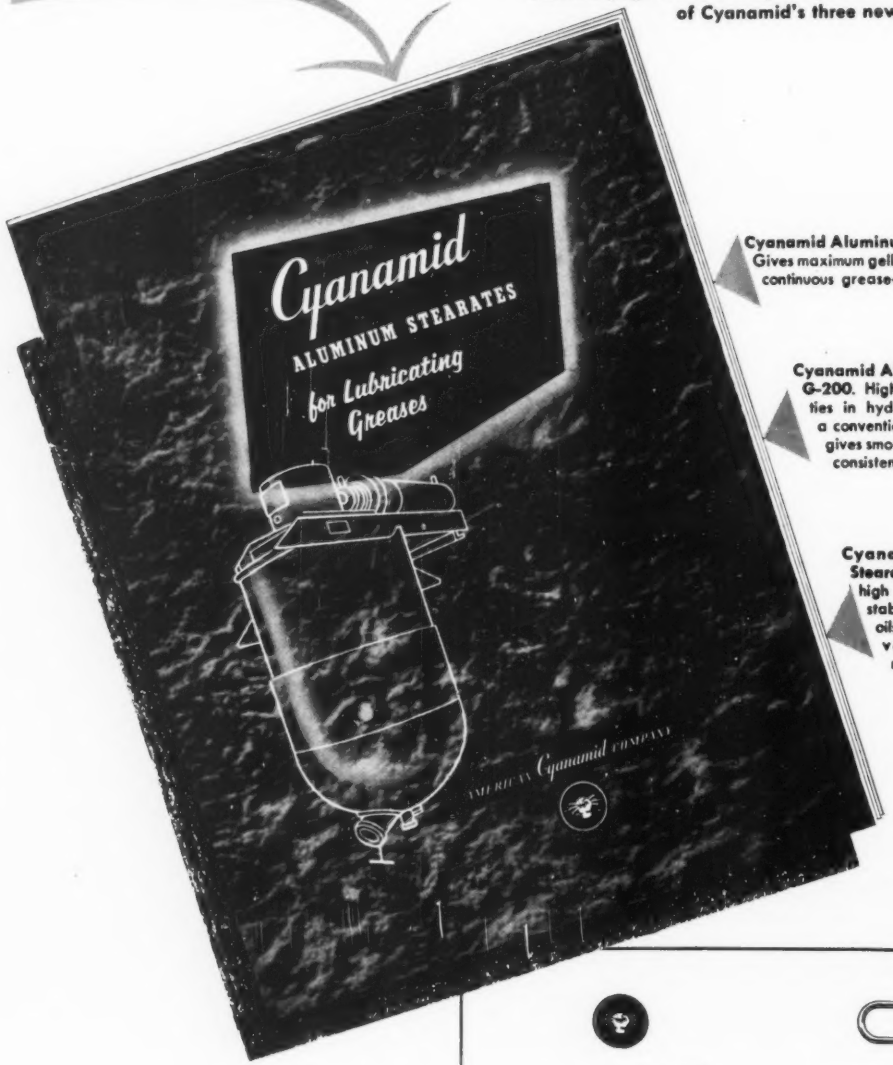

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KEYSER PROMOTED AT SOCONY-VACUUM

Paul V. Keyser, Jr. has been appointed to succeed Herbert Willetts as general manager of domestic marketing at Socony-Vacuum's headquarters in New York, it was announced recently.

Mr. Keyser is a member of the board of directors of N L G I and serves on its membership committee. Manager of Socony's lubrication department since 1947, Mr. Keyser for the past year has been chairman of the A P I's Marketing Division Lubrication Committee. Mr. Keyser joined Socony-Vacuum in 1930 in the technical service department. He was made manager of the department in 1938 and in 1943 was transferred to New York as assistant manager of the laboratories. He became manager of the research and development department a year later at the company's laboratories at Paulsboro, New Jersey.

Other executive changes at Socony-Vacuum headquarters include appointment of A. L. Nickerson to a vice-president and director in charge of foreign marketing operations; and Herbert Willetts to Mr. Nickerson's former position as director of domestic marketing.

In 1933 Mr. Nickerson started with Socony as a service station operator. He was made chairman of Vacuum Oil Co., Ltd. in London twelve years later. In 1946 he came to New York as director of domestic marketing of Socony-Vacuum. Mr. Nickerson, in his new position, replaces Walter L. Faust who is retiring.

As a clerk in the tank and pump department Mr. Willetts joined the company in 1923. Subsequently he became a salesman, district manager at Troy and Utica, New York, district manager at Buffalo, division manager at Philadelphia and New York, manager of central marketing division, and general manager of domestic marketing.

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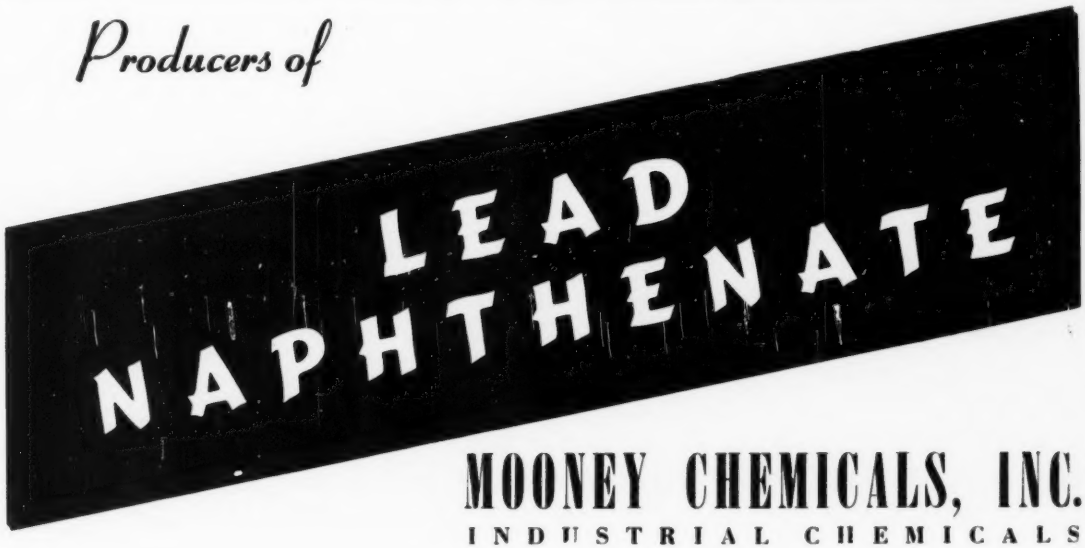

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API EARNS AWARD

(Continued from Page 34)

This was the first time that the American Petroleum Institute had entered the Annual Awards Competition. The A P I-O I I C material submitted for the trade association division competition embraced the period from October, 1950, through September, 1951.

The Oil Industry Information Committee is a non-profit group of more than 20,000 volunteer oil men in every state in the Union. A national committee charts the plans, and the volunteer oil men function under the guidance of 12 district offices. Their sole objective is "To help reaffirm the faith of the American people that their individual interests, as well as those of the nation, in peace or war, are best served by competitive, privately-managed oil businesses."

George Freyermuth, manager of the public relations department, Standard Oil Company (New Jersey), New York, served as national chairman for the O I I C program in 1950. John L. Dupree, of New York, who represents Socony-Vacuum Oil Co., is the current chairman. The 1952 chairman, who was elected early in November, is Charles Z. Hardwick, a director and vice-president of The Ohio Oil Co., Findlay, Ohio.

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API MAKES D. R. WAUGH SUPERVISOR . . .

(Continued from Page 30)

long has been active in business and community affairs. Following extensive newspaper work in Boston and New York, he had ten years executive experience in public relations, personnel administration and industrial relations in the steel, shipbuilding, ceramics and brewing industries.

Mr. Miller also reported that because of the growth in the number of O I I C committees and necessary expansion of the field public relations staff that a second supervisory position had been created in the New York headquarters. It will be filled by the promotion of Ben Ames, of Cincinnati, who will take the job of assistant supervisor of field operations. Mr. Ames, who has served as district representative in charge of the Kentucky - Ohio - Tennessee district for more than two years, has had 17 years of public relations, business and newspaper experience. He formerly was bureau manager for the United Press in Athens and Addis Ababa and also served as a chief of a psychological warfare branch in the Middle East and Southeastern Europe.

Other changes in the field staff for the 1952 program, Mr. Miller said, include the promotion of John B. Goodman, assistant district representative in the New York-New Jersey district the past year, to succeed Mr. Waugh at Boston and J. W. Lenon, assistant district representative in the Kentucky-Ohio-Tennessee district, to succeed Mr. Ames in Cincinnati.

ASLE ANNUAL MEETING WILL BE HELD IN APRIL

The American Society of Lubrication Engineers 1952 annual meeting will be held April 7, 8 and 9 at the Hotel Statler in Cleveland.

Thirty-three technical papers, three symposia and a plant tour provide wide coverage, variety and balance. Some highlights of the technical program now being arranged are:

FLUIDS FOR METALS WORKING —C. M. Larson (Sinclair) to present a paper on the practical aspects of cutting fluids. . . . Blade wear and tool life results with cutting fluids in carbide steel milling reported by J. R. Roubik (Kearney-Trecker).

GREASES—G. Grant (Dow Corning) to review extensive program on design considerations for the optimum performance of silicone greases. . . . Fundamental knowledge of lubricating grease structure will be discussed by B. W. Hotton (California Research).

INDUSTRIAL TRUCKS—The fundamentals of lubrication maintenance of electric and gasoline driven industrial trucks will be the subject of a paper by A. E. Dorod (Baker Industrial Truck).

FRETTING CORROSION (FRICTION OXIDATION)—D. Godfrey and E. E. Bisson (NACA) will report on some studies of the mechanism of surface damage by fretting. This presentation will be highlighted by an unusual color film showing actual fretting of steel against glass.

OIL FOG LUBRICATION—A discussion of the applications of oil fog lubrication and a review of extensive research into the behavior of lubricating aerosols will be covered by D. G. Faust (C. A. Norgren).

GEAR LUBRICATION—A discussion of lubrication and load carrying capacity of gears by E. T. Hutt (Shell-Thornton Research Center) will offer a keen insight into the problems in predicting gear and gear oil performance.

AIRCRAFT ENGINE LUBRICATION—Lt. L. D. Christensen (USAF Wright Air Development Center) will summarize work done to date on high performance lubricants for turbo-jet and turbo-prop lubricants and emphasize areas where additional research is required.

LUBRICANT CLASSIFICATION—A novel system developed by C. A. Bailey (National Tube) to overcome problems encountered in the identification of lubricants purchased under brand names and specifications will be reviewed.

LUBRICANT EVALUATION — A discussion of some newly developed equipment for evaluating oils and greases used in bearings and other applications will be given by R. J. S. Pigott (Gulf).

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